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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/071,405	02/08/2002	Frans Andreas Gerritsen	NL010106	1656

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BRIARCLIFF MANOR, NY 10510

EXAMINER

KRONENTHAL, CRAIG W

ART UNIT	PAPER NUMBER
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2627

DATE MAILED: 11/17/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No. 10/071,405	Applicant(s) GERRITSEN ET AL.	
Examiner Craig W. Kronenthal	Art Unit 2627	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 19 July 2005.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-9 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-9 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 19 July 2005 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All    b) ☐ Some \*    c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

## **DETAILED ACTION**

### ***Response to Amendment***

1. Applicant's amendment filed July 19, 2005, have been entered and made of record.
2. The objection to Figure 1 has been withdrawn in view of the amended drawings.

### ***Response to Arguments***

3. Applicant's arguments with respect to independent claims 1, 7, and 8 have been fully considered but they are not persuasive. The applicant argues in essence that Shiffman does not disclose identifying a region of interest on a basis of the cut plane. The examiner disagrees and indicates that Shiffman discloses dividing an image volume into parallel 2-dimensional planes in any direction (col. 8 lines 15-17). The examiner interprets each of these 2-dimension slices to be a cut plane. Note that these 2-dimensional slices are not necessarily the same as the acquired 2-dimensional images used to generate the image volume. Shiffman continues to explain that these planes may be used for segmenting a complex object image (col. 8 lines 20-24), which the examiner interprets to be the region of interest. Specifically, the region of interest is found by defining the contours of the object cross-sections on the basis of these 2-dimensional planes (col. 8 lines 45-49). Therefore, Shiffman reads on locating a region of interest on the basis of the cut plane.

### ***Drawings***

4. The drawings are objected to because in Figure 3 reference number 5 does not point to the reconstructed slice the examiner believes it was meant to label. The applicant has amended the drawing such that reference number 5 points to the same reconstructed slice as reference number 4. This is believed to be incorrect. The examiner believes the reference number 5 should point to the dark outlined plane that is perpendicular to reconstructed slice with reference number 3. Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. The replacement sheet(s) should be labeled "Replacement Sheet" in the page header (as per 37 CFR 1.84(c)) so as not to obstruct any portion of the drawing figures. If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

***Specification***

5. The disclosure is objected to because of the following informalities:
- The Specification is lacking headings for:
    - Background of the Invention
    - Summary
    - Brief Description
    - Detailed Description
  - Immediately preceding the claims a statement such as, "We claim" should be made.

Appropriate correction is required.

***Claim Rejections - 35 USC § 102***

6. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

7. Claims 1-4 are rejected under 35 U.S.C. 102(b) as being anticipated by Shiffman et al. (PN 6,424,732). (hereinafter Shiffman)

Regarding Claim 1: Shiffman discloses a method of processing images to identify regions of interest within a multi-dimensional data set, comprising the steps of:

- Acquiring image data in such a way that individual images succeed one another in a direction of succession (col. 6 lines 8-10) [The individual images are the 2-dimensional images (Fig. 2, 21, 26, and 32) and the direction of succession is the time dimension as is inherent in CT imaging.],
- Constructing a multi-dimensional data set is constructed from the individual images (col. 8 lines 4-5) [The multi-dimensional data set is the 3-dimensional volume (Fig. 8, 42) that results from stacking the 2-dimensional images (21, 26, 32).],
  - which multi-dimensional data set assigns data values to positions in a multi-dimensional space (col. 6 lines 61-62) [The image volume (42) assigns intensity levels to all points in a 3-dimensional space.],
  - established by the direction of succession and two directions parallel to the surface of the individual images (Fig. 8) [Figure 8 shows the direction of succession which is represented by the arrow to the left of the image volume (42). It also shows the cross sections belonging to the different 2-dimensional images (21, 26, 32). Observing this figure it is clear that the cross sections are stacked on top of one another in the direction of succession. The two directions parallel to the surface of the individual images are the two directions of the 2-dimensional images (21, 26, 32) which are not shown but understood to be the direction across the width of the figure and the direction into the figure.],

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- reconstructing a slice through the multi-dimensional data set along a cut plane through the multi-dimensional space (col. 8 lines 15-17) [The reconstructed slices are represented by the 2-dimensional planes {note these are referred to as 2-dimensional planes and not 2-dimensional images (21, 26, 32)} as shown in Figure 9.] such that, the direction of the cut plane has a component in the direction of succession (col. 8 line 17) [The cut plane is the direction in which the image volume (42) is sliced. Shiffman discloses that the slicing can be done in any direction, which means the direction of the cut plane can have a component in the direction of succession. In figure 9, the slices in the top left have a cut plane in the Y-Z directions, the slices in the top right have a cut plane in the X-Z directions, and the bottom slices have a cut plane in the X-Y directions.], and
- locating a region of interest on the basis of the cut plane (col. 9 lines 21-25) [The region of interest is the object that is composed of the cross-sections ascertained from the 2-dimensional planes which are the slices defined by the cut plane.].

The analogous arguments of claim 1 are applicable to claims 7, 8, and 9.

Regarding Claim 2: A method of processing images as claimed in claim 1, in which:

- Segmentation of a region of interest from the one or more relevant images is performed in one or more of the individual images (col. 8 lines 20-28). [The images are segmented by deciding which cross-sections belong to which objects. Multiple objects (Fig. 8, 13, 14, and 11 {which should be 16}) may be in one region of interest (Fig. 8, 42).]

- Such segmentation is performed on the basis of information in the reconstructed slice along the cut plane through the multi-dimensional data set (col. 8 lines 34-37). [The segmentation is done based on the results of modeling cross-sections with functions that allow for comparison. Area is the type of information in the reconstructed slice or 2-dimensional plane that is used for segmentation.]

Regarding Claim 3: Shiffman discloses a method of processing images as claimed in claim 2, in which:

- An edge is located in the reconstructed slice (col. 8 lines 37-40). [The contours of the cross-sections within the 2-dimensional planes are determined.]
- The segmentation of the region of interest in the one or more images is performed on the basis of the location of the edge found in the relevant image (col. 9 lines 1-6). [The contours are used to find the area of the cross-sections and based on the area the cross-sections are grouped together to segment the region of interest.]

Regarding Claim 4: Shiffman discloses a method of processing images as claimed in claim 3, in which:

- Respective slices through the multi-dimensional data set are reconstructed along a plurality of cut planes through the multi-dimensional space (col. 8 lines 15-17). [The reconstructed slices are represented by the 2-dimensional planes {note



these are referred to as 2-dimensional planes and not 2-dimensional images (21, 26, 32)} as shown in Figure 9.]

- The directions of the individual cut planes have components in the direction of succession (col. 8 line 17). [The cut plane is the direction in which the image volume (42) is sliced. Shiffman discloses that the slicing can be done in any direction, which means the direction of the cut plane can have a component in the direction of succession. In figure 9, the slices in the top left have a cut plane in the Y-Z directions, the slices in the top right have a cut plane in the X-Z directions, and the bottom slices have a cut plane in the X-Y directions.]
- Individual edges are tracked in the individual slices (col. 6 lines 43-45). [The isolabel contours of the cross-sections within the 2-dimensional planes are tracked by intensity thresholding.]
- And the segmentation of the region of interest in the one or more images is performed on the basis of the individual locations of the respective edges found in the relevant image (col. 9 lines 1-6). [The contours are used to find the area of the cross-sections and based on the area the cross-sections are grouped together to segment the region of interest.]

### ***Claim Rejections - 35 USC § 103***

8. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the

invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

9. Claims 5 and 6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shiffman in view of Han et al. (PN 5,457,754). (hereinafter Han)

Regarding Claim 5: Shiffman discloses a method of processing images as claimed in claim 4. Shiffman discloses the finding the boundaries of a region of interest but assumes that this boundary would be continuous and therefore does not disclose the use of interpolation. However, Han discloses a method for automatic contour extraction of a cardiac image in which:

- A boundary of the region of interest is derived by interpolation between the individual locations in the relevant image of the respective edges found (col. 16 lines 19-23). [Interpolation is used to create a continuous boundary as shown in Figures 28a, 28b, and 28c.]

It would be obvious to one skilled in the art to modify Shiffman with the process of interpolation as taught by Han because Shiffman stresses the importance of accurately determining the contours (col. 8 lines 40-44). Furthermore one would be motivated to make this modification to improve the accuracy of the boundary because as Han explains noise and discontinuities negatively impact the determining of the boundary. Han explains how interpolation is used in medical imaging, specifically of the heart, to account for these factors.

Regarding Claim 6: Shiffman discloses a method of processing images as claimed in claim 5. Shiffman discloses the finding the boundaries of a region of interest but assumes that this boundary would be continuous and therefore does not disclose the use of interpolation. However, Han discloses a method for automatic contour extraction of a cardiac image in which:

- The interpolation is performed inter alia on the basis of a priori information concerning the region of interest (23-26). [The a priori information is used to ensure the contours are not just continuous but meaningful as well.]

### ***Conclusion***

**10. THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the mailing date of this final action.

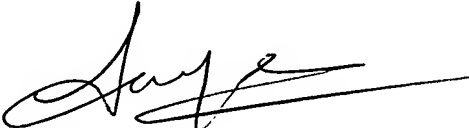
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Any inquiry concerning this communication or earlier communications from the examiner should be directed to Craig W. Kronenthal whose telephone number is (571) 272-7422. The examiner can normally be reached on 8:00 am - 5:00 pm / Mon. - Fri..

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Bhavesh Mehta can be reached on (571) 272-7453. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

11/02/05  
CWK



SANJIV SHAH  
PRIMARY EXAMINER